T R A N S L A T I O N

Description

HARD METAL OR CERMET CUTTING MATERIAL AND THE USE THEREOF

The invention relates to a hard metal or cermet cutting material for the machining of chromium-containing metal workpieces like for example austenitic, nickel-based alloys, stellites or steel with a carbide, nitride and/or carbonitride-containing hard material phase and a binder phase constituting 3 to 25% mass percent (%) of iron, cobalt and nickel.

The invention relates further to a use of the hard metal or cermet cutting material for the chip-removing machining of metal workpieces.

In hard metals like cermets, the binder serves to form a liquid phase at the sintering temperature which is in equilibrium with the hard material phase and can wet the latter. The liquid binder phase should have a significant solubility for the hard material phase at the sinter temperature but should upon cooling precipitate the latter again. Reactions of the binder phase with the hard material phase which can result in a decomposition or

consumption of the binder phase should be suppressed as much as possible. Furthermore, the binder phase should have mechanical properties which correspond to the intended use at the temperatures which prevail in use so that the binder can function as much as possible for the fixed but ductile retention of the hard metal or cermet body together.

It is already known that Cr_3C_2 with about 8 to 18% nickel as a binder can provide enhanced corrosion resistance for the hard metal.

In machining operations like turning, milling and drilling of certain types of steel, especially austenitic steel, an adhesion of the hard metal or cermet cutting material with the steel workpiece can occur, which because of the resulting increased wear of the cutting tool and the poor machining quality of the workpiece, is undesirable.

It is the object of the present invention to provide a cutting material and a method which can obviate this drawback.

According to the invention the hard metal or cermet cutting material comprises a binder phase with 10 mass % to 75 mass % Co, 10 mass % to 75 mass % Ni, 5 mass % to 30 mass % Cr, > 20 mass % to 60 mass % Fe, whereby the sum of the metals Co, Ni, Cr

and Fe does not exceed 100%. Further features of this cutting material are described in claims 2 to 5.

Thus the binder phase can in addition, contain respectively up to 5 % by weight V, Mo and/or Al, up to the solubility limits of Ti, W, Ta/Nb, Zr and/or Hf, as well as up to 15 weight % Mn. Furthermore, the binder can contain oxygen, nitrogen and/or boron up to their maximum solubilities. The content of carbon in the cutting material as so set that no η-phase and no C-porosity is present. Preferably the binder phase has no hexagonal component [proportion].

Basically the hard metal or cermet body of the invention utilizes the concept that between the metals being machined and the cutting material, with respect to the chromium content, there should be no difference in the concentrations of the alloying components between the workpiece and the tool or only a difference which is as small as possible. As a consequence an interdiffusion of the cobalt from the metal or cermet cutting material on the one hand and the alloying elements of the steel on the other hand during machining should be minimized. For this purpose the binder phase of the cutting material must contain apart from iron, nickel and cobalt also chromium, whereby a good wetability of the nickel and cobalt is ensured by the presence of at least 10% and a maximum of 75% content in the binder phase. By contrast with the Co-Ni-Fe binder known from WO 99/10549 with 40 to 90% by weight cobalt, the

balance iron and nickel with at least 4 weight % but not more than 36 weight % nickel or iron whereby the Ni-Fe ratio lies between 1.5:1 to 1:1.5, whereas with the present material for machining, the binder must contain chromium. By contrast with a cobalt binder phase with a hexagonal structure, the binder of the invention has a fcc structure. Above all the adhesion tendency of the cutting material can be avoided only by significant Cr content in the binder.

While the mechanism of the reactions and interactions between the metals contained in the steel and carbon are very complex, it has been surprisingly found in the machining of chromium-containing metal workpieces with a cutting material that optimum results can be obtained when the Cr in the binder phase of the cutting material is approximately equal to the Cr proportion in the workpiece material.